

Bi-Level Stairwell Fixture

The Product

Occu-Smart is a product line of unique bi-level fixtures that operate either at a low standby light level or instantly go to full light output when occupancy is detected by an integral ultra-sonic motion sensor.



Voyager model of the Occu-Smart bi-level fixture.

Function

This product is ideal for stairwells, restrooms, laundry rooms, or other areas where codes, building user preferences, safety, or security call for minimal light levels during unoccupied periods and full light output during occasional occupied periods. These fixtures provide maximum illumination when needed, but conserve significant amounts of energy by dimming when not needed.

Features

- High quality one- or two-lamp fixtures in 120V or 277V models.
- Linear ribbed acrylic lenses or prismatic lenses with linear reflective sides.
- High frequency, extremely sensitive ultra-sonic motion sensor mounted internally.
- Bi-level, step-down ballasts to 5, 10, or 33 percent of full light output, reducing power at standby from seven to 14 Watts depending on fixture configuration.
- 100-hour lamp conditioning circuit to assure long lamp life.
- Adjustable dwell time at full-on from 15 seconds to 30 minutes.
- Options available for vandal resistance or emergency operations. Fixtures with battery packs are UL listed as “emergency lighting and power equipment” and can be used instead of the common “headlamp” emergency backup lights.
- Five-year factory warranty on all ballasts and sensor components.
- All fixtures are UL listed and IBEW union made.
- Easy two-wire installation.

- Multiple “knockout” openings to facilitate any new or retrofit application.

Product Scenarios

This fixture is designed to be used in applications where occupancy is infrequent but minimum light levels are desired so occupants will feel comfortable entering the space (stairwells, restrooms, laundries, etc.). For this analysis, stairwell applications will be the focus. The new bi-level fixture is appropriate for both new and retrofit applications. Because T12 lamps are being phased out by law, they are not considered a viable base case alternative for new buildings. However, there are many old buildings where these fixtures have been used.

Supplier's Product Costs and Price

LaMar lighting is currently manufacturing a limited line of bi-level stairwell fixtures. The line is limited because multi-level ballasts are not currently available for all step-down percentages desired and are not always available for both 120V and 277V applications.

The following table illustrates the fixture/lamp/ballast/voltage combinations that are available and the manufacturer's list price as of September 15, 2003. These list prices are, of course, subject to change over time. Prices shown include estimates for dealer/distributor markup.

Configuration		120 Volts			277 Volts		
		33%	10%	5%	33%	10%	5%
4 Foot	1-Lamp	\$163.45	**	\$186.95	\$163.45	**	\$186.95
4 Foot	2-Lamp	\$163.45	\$172.25	\$186.95	\$163.45	**	\$186.95
2 Foot	U-Lamp	\$158.70	**	\$180.60	\$158.70	**	\$180.60
2 Foot	2 Lamp	**	**	\$182.25	**	**	\$182.25

**Not Available Note: Prices are for 40 fixtures or more in a single shipment.

Consumer's Installation-Related Costs

In retrofit applications, the total cost of installation must include the full cost of the replacement fixture, the cost of removing the old fixtures and installing the new one, and the cost of disposing of the old fixture.

In a new application, the cost of the “old” fixture that would have been used is replaced by the cost of the new fixture. There is only a small incremental increase in cost. The cost of labor to install either is basically the same. There is also no disposal cost for a replaced fixture. Thus, new applications are more cost effective and have a faster payback than retrofit applications because one can take full credit for the fixture not used.

Effects on Non-Energy Operations & Maintenance Cost

There is an important difference between the step-down function used in the LaMar bi-level fixture and fixtures that are simply turned off and on by a motion sensor. In the LaMar fixture, lamps are dimmed but power is not turned completely off. Therefore, when stairwell occupancy calls for full light output from the fixture, the ballast simply steps back up to full power. Note: it does not restart. It is starting that shortens lamp life. LaMar estimates that keeping lamps on full time can extend lamp life by as much as one- third.

It will be several years before actual field experience can confirm these estimates of extended lamp life. However, it is safe to say that bi-level fixtures are unlikely to have a negative impact on lighting maintenance by decreasing lamp life. In fact, it may have a significant positive benefit. In the analysis that follows, no credit is taken for extended lamp life at this time.

Energy and Demand Savings Potential

Bi-level fixtures save energy by stepping down power during the many hours of a day when the space is unoccupied. It is estimated by LaMar Lighting that unoccupied periods in typical stairwells are about 95 percent of the time.

It is also important to track energy use by lamp type. If the retrofit fixture being replaced is using old T12 lamps with high-energy use, there will be initial savings just for installing efficient T8 lamps in the new fixtures. Additional energy savings are achieved due to stepping down power for lighting during unoccupied periods.

It is important to remember that bi-level fixtures reduce both peak energy demand and energy consumption. Because these fixtures are on 24 hours per day, both types of energy saving are significant. If utility providers put a particular premium on either type of electricity use, it may be beneficial to redo this cost benefit analysis by calculating demand (kW) reductions and energy consumption (kWh) separately.

Non-Energy Benefits to Consumer

Because of the very unfortunate events of 9/11/01, the importance of lighting stairwells for safe emergency egress under extreme conditions has gotten increased attention from both building owners and property insurance companies. Many emergency preparedness experts are questioning whether current minimum light levels called for in life safety codes are really

sufficient for emergency egress situations, especially where smoke may be a factor. This bi-level stairwell fixture has the potential to significantly increase light levels in stairwells when needed, while keeping energy costs low.

Payback Period and Return on Investment

A fixture with a “brain”—the ability to sense occupancy and control light levels as a result—will always cost more than a standard construction-grade fixture. At present, the Occu-smart fixture is roughly three times more expensive than a standard fixture. In spite of the relative high cost, energy savings are so significant that paybacks can be instantaneous when compared with T12 fixtures and less than five years when compared against standard T8 fixtures.

The Bottom Line: Net Economic Benefit--Municipal Utility District-10.5¢/kWh

Base Case Fixture	New or Retrofit Bi-Level Fixture	Base Cost New Technology	Old Fixture Watts	New Fixture Watts	Level-2 Watts	Average Watts	Average kW Saved	kWhr saved per year	Yearly Savings
Municipal Utility Districts \$.105/kWh									
Product 1: 10% Standby (120V only)									
(2) F40T12 (4ft)	(2)F32T8 (4ft)10%	\$172.25	90	62	13	15.5	0.075	653.058	\$68.57
(1) F40T12 (4ft)	(2)F32T8(4ft)10%	\$172.25	50	62	13	15.5	0.035	302.658	\$31.78
(2) F32T8 (4ft)	(2)F32T8(4ft)10%	\$172.25	62	62	13	15.5	0.047	407.778	\$42.82
(1) F32T8 (4ft)	(2)F32T8(4ft)10%	\$172.25	32	62	13	15.5	0.017	144.978	\$15.22
Product 2: 33% Standby (120V or 277V)									
(2) F40T12 (4ft)	(2)F32T8(4ft)33%	\$163.45	90	62	28	29.7	0.060	528.228	\$55.46
(1) F40T12 (4ft)	(1)F32T8(4ft)33%	\$163.45	50	32	14	14.9	0.035	307.476	\$32.28
(2) F20T12 (2ft)	1T8Ulamp(2ft)33%	\$158.70	56	32	14	14.9	0.041	360.036	\$37.80
(2) F32T8 (4ft)	(2)F32T8(4ft)33%	\$163.45	62	62	28	29.7	0.032	282.948	\$29.71
(2) F32T8 (4ft)	(1) F32T8 (4ft)33%	\$163.45	62	32	14	14.9	0.047	412.596	\$63.95
(1) F32T8 (4ft)	(1)F32T8(4ft)33%	\$163.45	32	32	14	14.9	0.017	149.796	\$15.73
(2) F17T8 (2ft)	1T8Ulamp(2ft)33%	\$158.70	34	32	14	14.9	0.019	167.316	\$25.93
Product 3: 5% Standby (120V or 277V)									
(2) F40T12 (4ft)	(2)F32T8(4ft)5%	\$186.95	90	62	13	15.5	0.075	653.058	\$68.57
(1) F40T12 (4ft)	(1)F32T8(4ft)5%	\$186.95	50	32	8	9.2	0.041	357.408	\$37.53
(2) F20T12 (2ft)	1T8Ulamp(2ft)5%	\$182.25	56	32	8	9.2	0.047	409.968	\$43.05
(2) F32T8 (4ft)	(2)F32T8(4ft)5%	\$186.95	62	62	13	15.5	0.047	407.778	\$42.82
(1) F32T8 (4ft)	(1)F32T8(4ft)5%	\$186.95	32	32	8	9.2	0.023	199.728	\$20.97
(2) F17T8 (2ft)	1T8Ulamp(2ft)5%	\$182.25	34	32	8	9.2	0.025	217.248	\$33.67

Assumptions used in the “Net Economic Benefit” table above:

- Base cost of the standard technology (construction grade fixture): \$60.00.
- Expected life of the new bi-level fixture: 15 years.
- Labor cost for the retrofit application (remove and replace): \$50.00.
- Rebate or other incentive payment: none.
- Average electricity rate (demand and consumption): **10.5¢/kWh.**
- Time new fixture is on at full power: 5%.
- Time new fixture is on at minimum (stepped down) power: 95%.

- Total hours fixture is on per day: 24.
- Total days per year fixture is on: 365.

Payback and Avoided Cost—Municipal Utility District

Base Case Fixture	New or Retrofit Bi-Level Fixture	Avoided Costs	Direct Payback (New)	Direct Payback (Retrofit)	Optimal Direct Payback	Optimal Cost (New)	Cost Gap (New)	Optimal Cost (Retrofit)	Cost Gap (Retrofit)
Municipal Utility Districts \$.105/kWh									
Product 1: 10% Standby (120V only)									
(2) F40T12 (4ft)	(2)F32T8 (4ft)10%	\$457.35	N/A	3.24	2.5	N/A	N/A	\$121.43	\$50.82
(1) F40T12 (4ft)	(2)F32T8(4ft)10%	\$211.96	N/A	6.99	2.5	N/A	N/A	\$29.45	\$142.80
(2) F32T8 (4ft)	(2)F32T8(4ft)10%	\$285.57	2.62	5.19	2.5	\$167.04	\$5.21	\$57.04	\$115.21
(1) F32T8 (4ft)	(2)F32T8(4ft)10%	\$101.53	7.37	14.60	2.5	\$98.06	\$74.19	-\$11.94	\$184.19
Product 2: 33% Standby (120V or 277V)									
(2) F40T12 (4ft)	(2)F32T8(4ft)33%	\$369.93	N/A	3.85	2.5	N/A	N/A	\$88.66	\$74.79
(1) F40T12 (4ft)	(1)F32T8(4ft)33%	\$215.33	N/A	6.61	2.5	N/A	N/A	\$30.71	\$132.74
(2) F20T12 (2ft)	1T8Ulamp(2ft)33%	\$252.14	N/A	5.52	2.5	N/A	N/A	\$44.51	\$114.19
(2) F32T8 (4ft)	(2)F32T8(4ft)33%	\$198.15	3.48	7.18	2.5	\$134.27	\$29.18	\$24.27	\$139.18
(2) F32T8 (4ft)	(1) F32T8 (4ft)33%	\$288.95	1.62	3.34	2.5	\$219.88	-\$56.43	\$109.88	\$53.57
(1) F32T8 (4ft)	(1)F32T8(4ft)33%	\$104.90	6.58	13.57	2.5	\$99.32	\$64.13	-\$10.68	\$174.13
(2) F17T8 (2ft)	1T8Ulamp(2ft)33%	\$117.17	3.81	8.05	2.5	\$124.83	\$33.87	\$14.83	\$143.87
Product 3: 5% Standby (120V or 277V)									
(2) F40T12 (4ft)	(2)F32T8(4ft)5%	\$457.35	N/A	3.46	2.5	N/A	N/A	\$121.43	\$65.52
(1) F40T12 (4ft)	(1)F32T8(4ft)5%	\$250.30	N/A	6.31	2.5	N/A	N/A	\$43.82	\$143.13
(2) F20T12 (2ft)	1T8Ulamp(2ft)5%	\$287.11	N/A	5.40	2.5	N/A	N/A	\$57.62	\$124.63
(2) F32T8 (4ft)	(2)F32T8(4ft)5%	\$285.57	2.96	5.53	2.5	\$167.04	\$19.91	\$57.04	\$129.91
(1) F32T8 (4ft)	(1)F32T8(4ft)5%	\$139.87	6.05	11.30	2.5	\$112.43	\$74.52	\$2.43	\$184.52
(2) F17T8 (2ft)	1T8Ulamp(2ft)5%	\$152.14	3.63	6.90	2.5	\$144.18	\$38.07	\$34.18	\$148.07

Assumptions used in the “Payback and Avoided Cost” table above:

- All assumptions from the previous table (Net Economic Benefit) apply here.
- Net present value of a kWh: \$0.70.
- Optimal period for a direct payback: 2.5 years.